

IN THE CLAIMS:

Please amend claims 6, 8, 50 and 51 as indicated below. It is respectfully asked that claim 32 be moved and inserted preceding claim 27.

1    1. (previously presented) An incremental printer for  
2    forming desired images on a printing medium, by con-  
3    struction from individual marks in arrays; said printer  
4    comprising:  
5        at least one colorant-placing module for marking on  
6    such medium;  
7        a colorant carriage for holding and moving the at  
8    least one colorant-placing module over such medium;  
9        a motor and drive train for propelling said carriage  
10   over such medium;  
11        a first sensor, mounted to said carriage, for deter-  
12   mining condition or relative positioning of the at least  
13   one colorant-placing module;  
14        a second sensor for making color measurements of mark  
15   arrays formed on such medium by the at least one module;  
16        an auxiliary carriage for holding and moving the  
17   second sensor over such medium; said auxiliary carriage  
18   being selectively attachable to and detachable from the  
19   colorant carriage, but having substantially no drive train  
20   other than that of the colorant-carriage drive train; and  
21        means for controlling the motor and drive train, while  
22   the carriages are attached, to position the colorant car-  
23   riage and thereby the auxiliary carriage for substantially  
24   stationary measurement of such a mark array on such  
25   medium.

1 2. (previously presented) The printer of claim 1, where-  
2 in:

3 the second sensor is for making colorimetric meas-  
4 urements of the mark arrays.

3. through 5. (canceled)

1 6. (currently amended) The printer of claim 1, further  
2 comprising wherein:

3 means for excluding ambient light from the second  
4 sensor during the making of color measurements.

1 7. (previously presented) An incremental printer for  
2 forming desired images on a printing medium, by construc-  
3 tion from individual marks in arrays; said printer  
4 comprising:  
5 at least one colorant-placing module for marking on  
6 such medium;  
7 a first sensor for determining condition or relative  
8 positioning of the at least one colorant-placing module;  
9 a second sensor for making color measurements of  
10 marking arrays formed on such medium by the at least one  
11 module; and  
12 means for excluding ambient light from the second  
13 sensor during the making of color measurements, wherein  
14 the ambient-light excluding means comprise:  
15 a hood generally surrounding the second sensor lat-  
16 erally with respect to a sensing direction; and  
17 a mechanism for advancing the hood along the sensing  
18 direction toward such medium.

1 8. (currently amended) An incremental printer for form-  
2 ing desired images on a printing medium, by construction  
3 from individual marks in arrays; said printer comprising:  
4 at least one colorant-placing module for marking on  
5 such medium;  
6 a first sensor for determining condition or relative  
7 positioning of the at least one colorant-placing module;  
8 a second sensor for making color measurements of mark  
9 arrays formed on such medium by the at least one module;  
10 and  
11 a mechanism for advancing the second sensor into a  
12 measurement position at only low velocity and only low  
13 positioning accuracy needed for roughly positioning the  
14 second sensor over successive colorimetric test-pattern  
15 patches in turn;  
16 wherein said low velocity is on the order of a frac-  
17 tion of 13 ~~cm~~ (5 inches 34 cm) per second; and  
18 said low accuracy is on the order of the dimension of  
19 an individual patch mark.

1 9. (previously presented) An incremental printer for  
2 forming desired images on a printing medium, by construc-  
3 tion from individual marks in arrays; said printer  
4 comprising:  
5 at least one colorant-placing module for marking on  
6 such medium;  
7 a colorant carriage for holding and moving the at  
8 least one colorant-placing module over such medium;  
9 a motor and drive train for propelling said carriage  
10 over such medium;  
11 a first sensor, mounted to said carriage, for deter-  
12 mining condition or relative positioning of the at least  
13 one colorant-placing module;  
14 a second sensor for making color measurements of mark  
15 arrays formed on such medium by the at least one module;  
16 an auxiliary carriage for holding and moving the  
17 second sensor over such medium; said auxiliary carriage  
18 being selectively attachable to and detachable from the  
19 colorant carriage, but having substantially no drive train  
20 other than that of the colorant-carriage drive train;  
21 means for controlling the motor and drive train, while  
22 the carriages are attached, to position the colorant car-  
23 riage and thereby the auxiliary carriage for substantially  
24 stationary measurement of such a mark array on such medi-  
25 um; and  
26 a mechanism for advancing a component associated with  
27 the second sensor into contact with such medium.

1 10. (original) The printer of claim 1, further  
2 comprising:  
3 means for presenting at least one color reference  
4 target to the second sensor.

1 11. (previously presented) An incremental printer for  
2 forming desired images on a printing medium, by construc-  
3 tion from individual marks in arrays; said printer  
4 comprising:

5 at least one colorant-placing module for marking on  
6 such medium;

7 a first carriage for holding and moving the at least  
8 one colorant-placing module over such medium; and

9 a motor and drive train for propelling said first  
10 carriage over such medium;

11 a second carriage, discrete from the first carriage,  
12 for use in refining the quality of images produced by the  
13 printer; said auxiliary carriage being selectively attach-  
14 able to and detachable from the first carriage, but having  
15 substantially no drive train other than that of the first-  
16 carriage drive train; and

17 means for controlling the motor and drive train, while  
18 the carriages are attached, to position the first carriage  
19 and thereby the second carriage for substantially statio-  
20 nary operation in refining the quality of images.

12. and 13. (canceled)

1 14. (previously presented) An incremental printer for  
2 forming desired images on a printing medium, by construc-  
3 tion from individual marks in arrays; said printer  
4 comprising:  
5 at least one colorant-placing module for marking on  
6 such medium;  
7 a first carriage for holding and moving the at least  
8 one colorant-placing module over such medium at a speed  
9 for marking; and  
10 a second carriage, discrete from the first carriage,  
11 for use in refining the quality of images produced by the  
12 printer;  
13 wherein the second carriage scans a sensor over such  
14 medium at only low velocity and only low positioning accu-  
15 racy needed for roughly positioning the second sensor over  
16 successive colorimetric test-pattern patches in turn;  
17 said low velocity is a fraction of said marking speed;  
18 and  
19 said low accuracy is on the order of the dimension of  
20 an individual patch mark.

1 15. (previously presented) An incremental printer for  
2 forming desired images on a printing medium, by construc-  
3 tion from individual marks in arrays; said printer  
4 comprising:  
5 at least one colorant-placing module for marking on  
6 such medium;  
7 a first carriage for holding and moving the colorant-  
8 placing module over such medium; and  
9 a second carriage, discrete from the first carriage,  
10 for use in refining the quality of images produced by the  
11 printer;  
12 wherein the second carriage scans a sensor over such  
13 medium at only low velocity and only low positioning accu-  
14 racy needed for roughly centering the second sensor over  
15 successive colorimetric test-pattern patches in turn;  
16 wherein:  
17 the sensor is a sensor for making color measurements  
18 of marks formed on such medium by the at least one  
19 colorant-placing module; and  
20 the second carriage also holds at least one reference  
21 target for presentation to the sensor.

1 16. (original) The printer of claim 15, wherein:  
2 the sensor is a colorimetric sensor; and  
3 the reference target is a colorimetric reference  
4 target.



1 17. (previously presented) An incremental printer for  
2 forming desired images on a printing medium, by construc-  
3 tion from individual marks in arrays; said printer  
4 comprising:  
5 at least one colorant-placing module for marking on  
6 such medium;  
7 a first carriage for holding and moving the colorant-  
8 placing module over such medium; and  
9 a second carriage, discrete from the first carriage,  
10 for use in refining the quality of images produced by the  
11 printer;  
12 wherein the second carriage scans a sensor over such  
13 medium at only low velocity and only low positioning accu-  
14 racy needed for roughly centering the second sensor over  
15 successive colorimetric test-pattern patches in turn; fur-  
16 ther comprising:  
17 a hood generally surrounding the sensor laterally with  
18 respect to a sensing direction; and  
19 a mechanism for advancing the hood along the sensing  
20 direction toward such medium.

1 18. (previously presented) An incremental printer for  
2 forming desired images on a printing medium, by construc-  
3 tion from individual marks in arrays; said printer  
4 comprising:  
5 at least one colorant-placing module for marking on  
6 such medium;  
7 a first carriage for holding and moving the colorant-  
8 placing module over such medium; and  
9 a second carriage, discrete from the first carriage,  
10 for use in refining the quality of images produced by the  
11 printer;  
12 wherein the second carriage scans a sensor over such  
13 medium at only low velocity and only low positioning accu-  
14 racy needed for roughly centering the second sensor over  
15 successive colorimetric test-pattern patches in turn; fur-  
16 ther comprising:  
17 a mechanism for advancing a component associated with  
18 the sensor into contact with such medium.

1 19. (original) An incremental printer for forming de-  
2 sired images on a printing medium, by construction from  
3 individual marks in arrays; said printer comprising:  
4 at least one colorant-placing module for marking on  
5 such medium;  
6 a sensor for measuring color properties of colorant  
7 marked on such medium by the colorant-placing module;  
8 a hood generally surrounding the sensor laterally with  
9 respect to a sensing direction, for excluding ambient  
10 light from the sensor during the color-property measuring;  
11 and  
12 a mechanism for automatically advancing the hood along  
13 the sensing direction toward such medium.

1 20. (original) The printer of claim 19, wherein:  
2 the hood-advancing mechanism advances the hood into  
3 contact with such medium.

1 21. (previously presented) The printer of claim 20,  
2 wherein:  
3 the hood comprises, at a forward surface thereof, a  
4 compliant material for facilitating an effective contact  
5 between the hood and such medium.

1 22. (original) The printer of claim 19, wherein:  
2 the hood is movable with respect to the sensor; and  
3 the hood-advancing mechanism is for advancing the hood  
4 with respect to the sensor.

1 23. (original) The printer of claim 22, wherein:  
2 the hood-advancing mechanism advances the hood into  
3 contact with such medium.

1 24. (original) The printer of claim 23, wherein:  
2 the hood comprises, at a forward surface thereof, a  
3 compliant material for facilitating an effective contact  
between the hood and such medium.

1 25. (original) The printer of claim 19, further  
2 comprising:  
3 a door for protecting the sensor when not in use;  
4 wherein the hood-advancing mechanism also comprises  
5 means for opening the door for measurements by the sensor.

26. (canceled)

NOTE: Applicant respectfully requests insertion  
of claim 32 here, preceding claim 27.

1 27. (previously presented) The printing system of claim  
2 32, wherein:  
3 the door-opening mechanism also moves the sensor into  
4 a measurement position.

1 28. (previously presented) The printing system of claim  
2 32, wherein the door-opening-and-closing mechanism is:  
3 for automatically opening the door substantially in  
4 preparation for use of the sensor; and also  
5 for automatically closing the door promptly after use  
6 of the sensor.

1 29. (previously presented) The printing system of claim  
2 32, wherein:  
3 the at least one sensor has multiple optical surfaces;  
4 and  
5 the door is for protecting substantially all of the  
6 multiple optical surfaces from being coated by atmospheri-  
7 cally carried residual liquid ink when the at least one  
8 sensor is not in use, including whenever the printing  
9 system is in use for forming images.

1 30. (previously presented) The printing system of claim  
2 32, wherein the at least one sensor comprises:  
3 a sensor for measuring color properties of the pre-  
4 viously received ink; and  
5 a sensor for determining, from patterns of the previ-  
6 ously received ink, condition of the at least one inkdrop-  
7 placing module.

1 31. (previously presented) The printing system of claim  
2 32, wherein:  
3 the at least one inkdrop-placing module comprises at  
4 least two modules for placing ink; and  
5 the at least one sensor comprises:  
6  
7 a sensor for measuring color properties of the  
8 previously received ink, and  
9  
10 a sensor for use in determining, from patterns of  
11 the previously received ink, condition or  
12 relative positioning, or both, of the  
13 inkdrop-placing modules.

NOTE: Applicant respectfully requests that claim 32 (below) be moved and inserted before claim 27.

1 32. (previously presented) An incremental printing sys-  
2 tem for forming desired images on a printing medium, by  
3 construction from very large numbers of individual liquid-  
4 ink drops ejected onto such medium in arrays; said print-  
5 ing system comprising:

6 at least one inkdrop-placing module for ejecting very  
7 large numbers of liquid-ink drops onto such medium sub-  
8 stantially whenever the printing system is in use for  
9 forming images;

10 at least one sensor, having at least one optical  
11 surface, for infrequently measuring, substantially when  
12 the printing system is not in use for forming images,  
13 characteristics of ink previously received on such medium  
14 from the at least one inkdrop-placing module;

15 an automatic microprocessor for using the measured  
16 characteristics in refining operation of the inkdrop-plac-  
17 ing module, to optimize the quality of images formed on  
18 such medium thereafter;

19 a door for protecting the at least one optical surface  
20 of the at least one sensor from being coated by atmospher-  
21 ically carried residual liquid ink when the at least one  
22 sensor is not in use, including whenever the printing  
23 system is in use for forming images; and

24 a mechanism for automatically opening the door before  
25 use of the at least one sensor, and for automatically  
26 closing the door after use of the at least one sensor;

27 wherein the microprocessor can reliably optimize the  
28 quality of images, free from measurement degradation by  
29 coating of liquid ink on the at least one optical surface;  
30 and

31 means for measuring at least one absolute color ref-  
32 erence when the door is not open to admit color charac-  
33 teristics of the previously received ink to the sensor.

1 33. (original) The printing system of claim 32, wherein:  
2 the absolute-reference measuring means comprise at  
3 least one color reference target that is exposed to the  
4 sensor when the door is closed.

1 34. (original) The printing system of claim 33, wherein:  
2 the color reference target is carried on a surface of  
3 the door.

1 35. (previously presented) The printing system of claim  
2 32, wherein:  
3 the door is a shutter.

1 36. (original) The printing system of claim 35, wherein:  
2 the shutter is in a plane generally parallel to such  
3 printing medium, and slides open and shut generally within  
4 said plane.

37. through 41. (withdrawn)

42. (canceled)

1 43. (previously presented) An incremental printer for  
2 forming desired images on a printing medium, by construc-  
3 tion from individual marks in arrays; said printer  
4 comprising:  
5 at least one colorant-placing module for marking on  
6 such medium;  
7 a sensor for measuring color properties of colorant  
8 marked on such medium by the colorant-placing module;  
9 a moving carriage for automatically positioning the  
10 sensor over colorant on such medium; and  
11 at least one reference target disposed for exposure to  
12 the sensor to provide a colorimetric reference measurement  
13 for use in conjunction with said measured color properties  
14 of colorant marked on such medium;  
15 wherein the at least one reference target is carried  
16 on the moving carriage.

1 44. (previously presented) The printer of claim 43,  
2 wherein:  
3 the at least one reference target is stationary, and  
4 the moving carriage comprises means for automatically  
5 positioning the sensor over the at least one reference  
6 target.

1 45. (original) The printer of claim 44, further  
2 comprising:  
3 a shutter for protecting the at least one reference  
4 target; and  
5 means actuated by the moving carriage for controlling  
6 the shutter.



1 46. (previously presented) The printer of claim 43,  
2 wherein:  
3 the at least one reference target comprises a white  
4 target.

1 47. (original) The printer of claim 46, wherein:  
2 the at least one reference target also comprises a  
3 black target.

1 48. (amended) The printer of claim 43, wherein:  
2 the at least one reference target comprises one or  
3 more gray targets.

1 49. (original) The printer of claim 48, wherein:  
2 the at least one reference target also comprises a  
3 chromatically colored target.

1 50. (currently amended) [[t]] The printer of claim 8,  
2 wherein:  
3 the low positioning accuracy is a fraction of said  
4 dimension.

1 51. (currently amended) The printer of claim 14, wherein:  
2 said low velocity is a fraction of 13 ~~cm~~ (5 inches 34  
3 cm) per second; and  
4 the low positioning accuracy is a fraction of said  
5 dimension.

1 52. (previously presented) An incremental printer for  
2 forming desired images on a printing medium, by construc-  
3 tion from individual marks in arrays; said printer  
4 comprising:  
5 at least one colorant-placing module for marking on  
6 such medium;  
7 a colorant carriage for holding and moving the at  
8 least one module over such medium;  
9 a motor and drive train for propelling said carriage  
10 over such medium;  
11 a first sensor, mounted to said carriage, for deter-  
12 mining condition or relative positioning of the at least  
13 one colorant-placing module;  
14 a second sensor for making color measurements of mark  
15 arrays formed on such medium by the at least one module;  
16 an auxiliary carriage for holding and moving the  
17 second sensor over such medium; said auxiliary carriage  
18 being selectively attachable to and detachable from the  
19 colorant carriage, but having substantially no drive train  
20 other than that of the colorant-carriage drive train; and  
21 a mechanism for advancing a component associated with  
22 the second sensor into contact with such medium.